

## WE CLAIM:

1. A controller for managing bandwidth in a communications network, the controller comprising:

- 5           a service controller;  
          a service interface between the service controller and a service network element in the network for managing paths; and  
          a facility interface between the service controller and a transport network element in the network for managing connections,  
10           the service controller being operable to set up paths automatically and dynamically balance the bandwidth utilization among a plurality of selected paths in response to current traffic requirements on the plurality of selected paths.

- 15           2. The controller of claim 1, wherein the service controller is further operable to establish connections automatically in response current traffic requirements on the said plurality of selected paths.

- 20           3. The controller of claim 2, wherein the service controller is further operable to set up the paths automatically in accordance with user-defined policies.

- 25           4. The controller of claim 3, wherein the service controller comprises a database for storing the user-defined policies.

5. The controller of claim 4, wherein the service controller further comprises algorithm plug-ins for selectively changing aspects of the service controller functionality.

- 30           6. The controller of claim 5, wherein the service controller further comprises:  
          a metrics database; and  
          data filters,

the service controller further operable to provide metrics monitoring in accordance with the metrics database information and data filters.

7. The controller of claim 6, further comprising a management  
5 interface for maintaining said user-defined policies.

8. The controller of claim 7, wherein said management interface is operable to obtain audit trails and explanations of every action performed, and obtain recommendations from the service controller on actions to be  
10 performed.

9. The controller of claim 2, further comprising an intra-layer interface for communication with another controller.

10. A network controller comprising a plurality of the controllers of  
15 claim 1 logically arranged in a hierarchical control structure, whereby at least one of said controllers is operable to control the operation of the other controllers.

11. The controller of claim 1 at a node in the network, the node  
20 comprising a service node and a facility node.

12. The controller of claim 11 wherein the service node comprises  
a core router.

13. The controller of claim 12 wherein the facility node comprises  
25 an optical transport switch.

14. The controller of any one of claims 1 to 13 wherein the paths  
30 are layer-3 paths and the connections are layer-1 connections.

15. A controller for a communications network comprising:

resource conservation means for automatically maintaining the bandwidth allocation of paths between two service nodes in the network at a level that is adjusted dynamically in accordance with a current traffic utilization level of the paths; and

- 5           resource deployment means for automatically redistributing network resources between the paths.

16. A controller as claimed in claim 15, wherein said resource conservation means is operable to allocate additional bandwidth to a path  
10 automatically whenever the current traffic utilization level on said path exceeds a high threshold.

17. A controller as claimed in claim 16, wherein said resource conservation means is operable to reduce the bandwidth allocated to a  
15 path automatically whenever the current traffic utilization level on said path is below a low threshold.

18. A controller as claimed in claim 17, wherein said resource conservation means is operable to reduce bandwidth allocated to said  
20 path automatically in decrements that are smaller than a previous increment of additional bandwidth allocated to said path.

19. A controller as claimed in claim 18, wherein said resource deployment means is operable to create a new path automatically  
25 between said two service nodes if the bandwidth allocation of said path cannot be increased.

20. A controller as claimed in claim 19, wherein said resource deployment means is operable to manage connections automatically in a  
30 facility layer based on new demands in a service layer.

21. A network controller comprising a plurality of the controllers of claim 15 logically arranged in a hierarchical control structure, whereby at

least one of said controllers is operable to control the operation of the other controllers.

22. The controller of claim 15 wherein the communications  
5 network is a packet-based services network.

23. The controller of claim 22 wherein the packet-based services network is an IP network.

10 24. The controller of anyone of claims 15 to 19 wherein the paths are MPLS paths.

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